

BNSF Railway



ETMS

**Electronic Train
Management System**



**Rick Lederer
AVP Network Control Systems**

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Hy-rail Limits Compliance System

- **HLCS: Provides foundation for ETMS**
 - **GIS**
 - **Peer to peer telecom network**
 - **Proximity warnings**
 - **Authority limits**
 - **1700 Hy-rails installed**
 - **27 exceeds in 2004**
 - **3 missed repeats**
 - **6 TWC rollup**
 - **14 movement beyond limits**
 - **4 authority revoked**

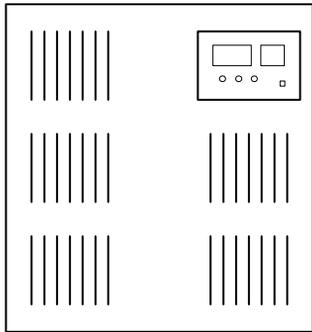
ETMS – What Is It?

- **A safety-overlay system that works in conjunction with existing methods of train operations. ETMS enforces compliance with existing methods of operation and rules.**
- **Provides a “safety net” for train operations while retaining current operating practices and rules as a primary means of train control.**
- **Enforces compliance with train movement authorities, speed restrictions, switch positions and work zones.**

ETMS – How Does It Work?

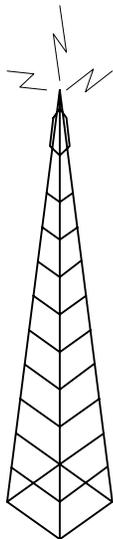
- **Integrates and interlocks information from existing systems that affect the safe movement of trains into the cab of the locomotive.**
- **Comprised of four segments:**
 - **Office segment**
 - **Communication segment**
 - **Locomotive segment**
 - **Wayside segment**

ETMS – How Does It Work?



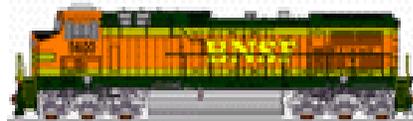
OFFICE SEGMENT

- Train Dispatch System
- Track Bulletin System
- Transportation Support System (TSS)
- Geographic Information System (GIS)



COMMUNICATION SEGMENT

- Meteorcomm Low Band
 - 802.11 High Band



Locomotive Segment

WAYSIDE SEGMENT



Signal Aspects



Track Integrity



Switch Position

- On-Board Computer
- On-Board Display
- GPS, Radio & Locomotive Computer Interfaces

1010

11

1000

100

100

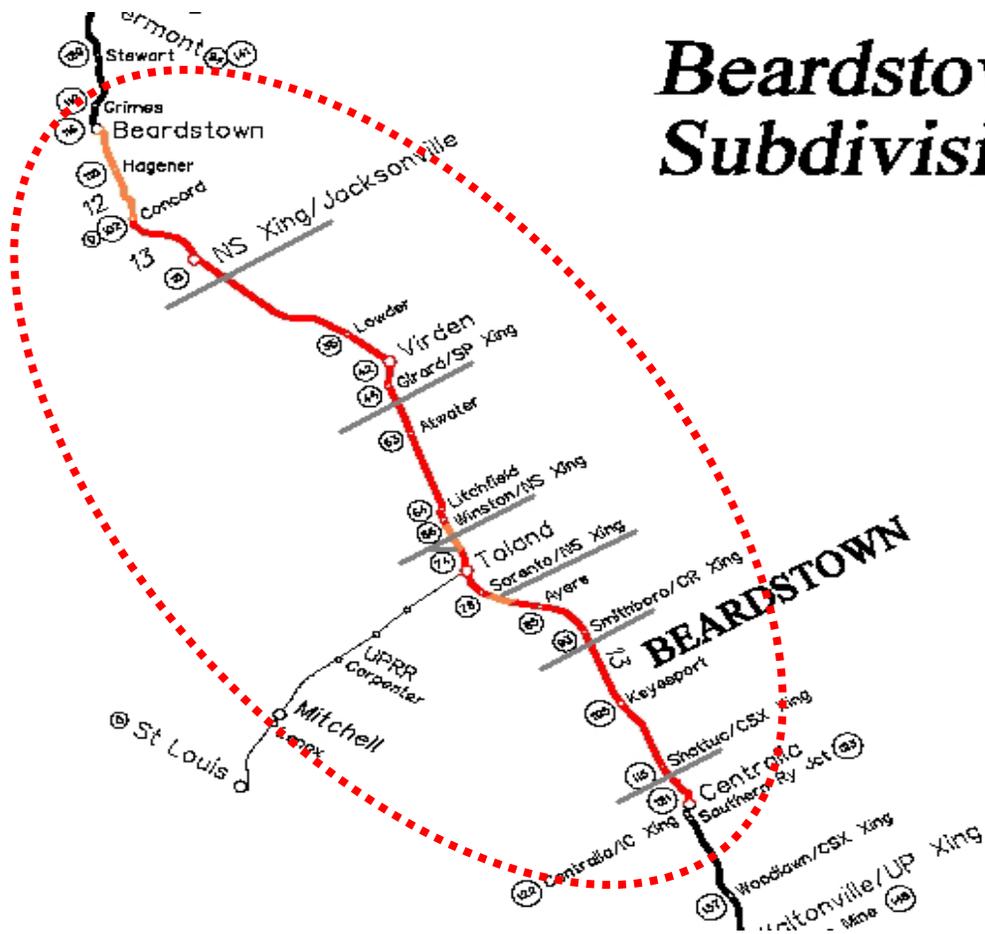
ETMS - Benefits

- **Safety related**
 - **Train collisions**
 - **Roadway worker protection**
 - **Speed compliance**
 - **Broken rail protection**
 - **Switch position verification**

ETMS Pilot Overview

- **Pilot contract signed July 10th, 2003**
- **50 locomotives; 40 C44-9, and 10 GP39-2**
- **134 miles of track, Beardstown to Centralia, Illinois (Beardstown Sub)**
 - **Single track with 10 passing sidings**
 - **70 wayside devices**
 - **35 switch sites**
 - **33 switch and Signal combined sites**
 - **2 broken rail detection circuits**

ETMS – Where Is It Located?



Beardstown Subdivision

ETMS Authority Types

- **CTC (13.0 miles)**
 - Beardstown to East Concord ~12.2 miles (MP 114.3X – MP 0.1)
 - Winston-NS Xing to NS Jct. ~0.6 miles (MP 65.6 – MP 66.2)
 - Sorento ~0.2 miles (MP 77.7 – MP 77.9)
- **TWC (118.1 miles)**
 - CTC Concord to CTC Winston-NS Xing ~65.5 miles (MP 0.1 – MP 65.6)
 - CTC NS Jct. to CTC Sorento ~ 11.5 miles miles (MP 66.2 – MP 77.7)
 - CTC Sorento to CTC Centralia ~ 41.1 miles (MP 77.9 – MP 119.0)
- **Restricted Limits (7.0 miles)**
 - Beardstown Yard ~ 2.0 miles (MP 116.3 – MP 114.3)
 - Centralia Yard ~ 5.0 miles (MP 119.0 – MP 124.0)
- **Interlockings**
 - Jacksonville NS-M
 - Girard UP-M (IDOT Track)
 - Winston-NS XING-M
 - Smithboro CSX-M (CR)
 - Shattuc CSX-A



Girard-UP Xing Interlocking

ETMS System Testing

- **Completed July 2, 2004**
- **417 scripted tests over 16 weeks.**
- **Over 2500 pages of test documentation and evaluation reports generated**
- **Phase 1**
 - **Regression tests completed October 4, 2004**
- **Phase 2**
 - **Testing completed February 25, 2005**
 - **Regression tests scheduled for March 14, 2005**

ETMS Revenue-Service Pilot

- **Began October 12, 2004**
 - **Phase 1 – (“Braking in Progress” message)**
 - **Complete 666 runs in revenue demonstration service**
 - **Complete Concept of Operations and Data Collection Plans**
 - **Closure of Category 1 and 2 Software Trouble Reports**
 - **Phase 2 – (system brakes train)**
 - **Complete 666 runs in revenue demonstration service**
 - **Additional data collection requirements**
 - **Closure of all software trouble reports**
 - **Phase 3 –**
 - **Implement ETMS in extended revenue demonstration**

ETMS Results

- **803 trains operated with ETMS as of February 28**
- **38 engineers qualified**
- **9,300 track warrants delivered**
 - **8,500 delivered enroute**
- **10,600 speed restrictions**
- **51% of trains on Beardstown sub ETMS equipped**

BNSF
RAILWAY